

wrist was reduced to $8\frac{1}{4}$ inches in circumference. It was allowed to heal. Three and one-half months after the operation, he "made a whole hand" in the harvest field, raking and binding a swath of wheat for three consecutive days; and during the two years that have elapsed he has engaged in manual labour as a farm hand, suffering with scarcely any pain or other inconvenience. After excessive or long-continued exertion of the wrist, he says "it feels like giving out."

Prof. Gross in his *System of Surgery*, vol. i. p. 633, 5th ed., says this affection (chronic enlargement of the bursa) is "often very obstinate and troublesome, resisting not unfrequently the best directed efforts of the surgeon for their removal," and recommends "sorbofacient applications, as iodine and hydrochlorate of ammonia, blisters, mercurial inunctions, and systematic compression," and when these measures fail, "thorough excision," with the precaution to avoid injury to the synovial membrane of the articulations, but he does not mention division of the annular ligament as a remedy in the enlargements under consideration. We make special reference to Prof. Gross' treatment of this affection, because he is universally regarded as high surgical authority.

A remarkable feature in my case is that the integrity of the articulations and muscles was so slightly impaired by the morbid condition surrounding them for so many years, as to regain much of their former strength and usefulness, and that too in a short time after being relieved from their bondage. The fact that the location of the trouble in the two cases was in different parts of the wrist—one on the anterior and the other on the posterior portion, and that both were relieved by dividing the annular ligament subjacent to the affected part, strengthens the theory advanced by Mr. Syme. That the result of this operation in these two cases far exceeds the prognosis by the ordinary treatment is evident, and should, we think, recommend it to the favourable attention of the profession, and, in the language of Mr. Syme, "the complete success of which encourages me to hope that the method pursued will be found to afford an effectual remedy for a complaint which has hitherto proved so troublesome."

ARTICLE XV.

AMPUTATION AT THE SHOULDER-JOINT. By L. McLANE TIFFANY, M.D.,
of Baltimore, Professor of Surgery in the University of Maryland.

WHILE amputation of the arm at the shoulder-joint is a very successful operation, indeed, probably the most successful of major amputations, yet a fatal case occurring under my care, from secondary hemorrhage, has caused me to think that possibly, certain dangers being recognized, the mortality may be still further decreased.

What I shall say has special reference to cases of ex-articulation at the scapulo-humeral joint when necessitated, not only by bone injury, but accompanied by extensive lesion of soft parts,—such wounds, in fact, as are apt to be followed by sloughing.

There seems to be no end to the list of methods of procedure which at one time or another have been called into requisition to effect the desired result, Velpeau saying “that whoever had operated once considered it necessary to propose a new method.”

Le Dran passed a needle deeply beneath the artery and secured it over a compress. Then he made a transverse incision through the deltoid just below the acromion, effected the disarticulation and made a long axillary flap. The artery was then tied properly. La Faye made a large rectangular flap containing the deltoid, raised it, exposing the artery, which he tied, and divided the axillary tissues transversely; thus exactly reversing Le Dran's method. Dahl and Portal are credited with similar methods, replacing only the rectangular flap by a V-shaped one, apex down. Garengeot's method differed from that of Le Dran, inasmuch as both flaps were quadrilateral, and of equal length; he passed a provisional ligature beneath the main vessel. Dupuytren, Onsenort, and Cline are credited with methods differing but little from the preceding, the flaps being either cut by transfixion, or from without inwards. Bell made a circular incision joined by two lateral ones, thus forming rectangular flaps. Lisfranc improved Dupuytren's methods by entering the knife in the coraco-acromial space, opening the joint at once. Laroche, Sharp, Desault, Larrey, Dupuytren, Delpech, Scoutetten, Hello, Graefe, Sanson, Cornuau, Guthrie, Alanson, Verneuil, Velpeau, Spence, Pozet, Bertrandi, have all suggested modifications of existing methods according as circumstances seemed to warrant, until it would appear as if the subject were well exhausted, especially as Velpeau (Mott's translation, vol. ii. p. 561) has tried the “ovalar process reversed,” by which we are forced to imagine that he made his flaps attached to the amputated member and not to the trunk.

It is well recognized that in the treatment of disease where many remedies are mentioned, there is no specific, and this idea holds good of shoulder-joint amputations, so that it is fair to suppose that no method can justly be worthy the title of best.

The articulation is so well covered in front, behind, and above, that sufficient flap can always be obtained, while the vascular anastomoses are so free from the axilla and elsewhere, that sloughing occurs rarely, except as the result of direct violence, or, of course, hospital gangrene. Lastly, it must be remembered that the axilla is open below, and that it is a difficult matter to prevent good drainage, a fortunate circumstance having much to do with the recorded small mortality.

Attempting to see what operative measures have obtained the greatest success, I turned to the “Medical and Surgical History of the War,”

finding at p. 620 Surg. vol. 2d Pt. a record of 368 cases of primary amputation at the shoulder which recovered. The operation is described in 179 cases as follows :—

	Times.
Oval flap	26
Lisfranc	12
Larrey	10
Transfixion	16
Lateral flap	10
Antero-posterior flap	24
Double flap	23
Flap	44
External flap	4
Dupuytren	3
Circular	6
Malgaigne	1

In this it is probable that oval and Larrey refer to one and the same method, that Lisfranc and transfixion are each used to express the same manner of amputating; but lateral flap, antero-posterior flap, double flap, flap, leave very confused impressions in the mind of the reader as to the course of the incisions. Turning to page 632 of the same volume, there are recorded 117 fatal primary shoulder-joint amputations; in these cases the operation is described 45 times, the terms used being very similar to those in the first series.

Wishing to define the incisions described in the Medical and Surgical History, I consulted the usual text-books and discovered at a glance the cause of confusion, namely, that surgical authorities describe the same operation very differently; thus, Larrey's Amputation, Gross (vol. ii. p. 1075) says is formed of two oval flaps, one in front and the other behind (antero-posterior). Holmes (vol. iii. p. 78) describes Larrey's amputation as consisting of lateral flaps. A flap formed of the deltoid is called external or posterior by different writers, etc. etc. This lack of definition renders comparison of various methods impossible until a uniform system of nomenclature be adopted. In the absence of definite tabulated experience, and recognizing that many ways are advised by competent surgeons, it is tolerably safe to conclude that each case should be judged on its own merits, and flaps fashioned accordingly.

The fatal case to which I have referred is the following :—

CASE I.—J. B., aged 35 years, was run over by a train of loaded railway cars. The right humerus was crushed extensively, the head of the bone being comminuted; the skin covering the inner and anterior aspect of the arm was almost all torn away; the chest was much bruised.

I amputated at shoulder-joint by tying the axillary artery in the wound, fashioning a flap out of skin from behind and over the deltoid, and finally picking the fragments of humerus from the walls of the chest, some pieces being thrust deeply into the pectoral muscle. Sloughing of the bruised tissue took place, and the patient died of hemorrhage from the axillary artery on third day.

Post-mortem examination revealed a ragged opening in the artery nearly one inch above the ligature. Evidently the vessel had been injured and gave way when suppuration was established.

Now it is possible that although the shape of the flaps may be a matter of small importance, yet there are other circumstances incident to amputation, a due regard to which may be of advantage to the patient, and one of prime interest is the treatment of the main artery, and it is to this that I wish to call attention in this paper; incidentally also to the nerves.

Turning to the "Medical and Surgical History," etc., I find, Surg. vol. part 2, page 635, as follows: "The causes of fatal results in this series of one hundred and seventeen amputations are not particularly specified in more than one-half the instances. Consecutive hemorrhage is assigned as the cause of fatality in twelve cases, including nine in which large trunks were tied." About one case in five.

On page 642 is a record of seventy-five fatal cases of intermediary amputations (from 3d to 30th day); the cause of death is given in fifty-nine instances, and of these, thirteen succumbed to hemorrhage; one in four and a half. So large a proportion in the above tables of fatal cases is due to hemorrhage as to justify any suggestion for operating with a view to obtaining more successful results. Unfortunately the history of the cases as published does not enable one to appreciate the reason why hemorrhage took place, but a certain number, cases 20, 26, 77, 89 (table 44, page 632), clearly show gunshot injury high up the arm, such as might well be followed by sloughing with the usual accidents.

In civil practice amputation at the shoulder other than for tumours is rarely required, except for railway or machinery crushes, and it is under just such circumstances that the influence of violence is felt far beyond the region immediately involved, and therefore the tendency to suppurate is felt beyond the site of visible injury. Not only will bones be fissured, as after gunshot wounds, but the muscles show rupture of fibre and points of extravasated blood throughout their length; the conduct of vessels subject to violent extension is too well known to require more than passing mention. Amputation for crushing injury, unless effected at some distance from the seat of violence, is always followed by much suppuration, and where the injured member is very muscular, suppuration is apt to be correspondingly profuse; again, in consequence of unequal strain being put upon different muscles they will be injured in different degrees and slough unequally.

When crushing injury occurs in the neighbourhood of the shoulder, so near indeed that the flaps formed in amputation are composed of strained if not bruised tissue, suppuration and sloughing result, which is very apt to extend along the intermuscular spaces, in which spaces, of course, are found vessels and nerves; it follows necessarily then that divided vessels

should be secured some distance from the face of the flap, the ligated point being thereby further removed from the site of suppuration.

Again, the humerus being comminuted, the arm is greatly shortened by muscular retraction, the artery retracts, and on amputating, the vessel is divided at a lower level than would occur were the bone not broken, or in other words at a point which has already been subjected to the same violence that broke the bone, for it is to be remembered that the vessel usually escapes destruction at the same time that the bone is crushed. This renders the artery apt to give way when profuse suppuration of the bruised flaps occurs, since the vitality of the arterial tunics is still further impaired by the neighbouring inflammatory process. This is the explanation to which I was led when considering the circumstances attending the fatal issue in Case I., and in subsequent operations to avoid a similar untoward result, I have always ligated the main vessel at a distance from the face of the wound through a new incision if necessary, or else have dissected the vessel from the flap by drawing it strongly down, and tying it quite a distance from the point of section. It is scarcely necessary to say that the flaps are to be left well open that the products of inflammation may freely escape.

The method of procedure is simple; the arm being removed, the axillary artery is grasped with toothed forceps, drawn out and stripped of connective tissue for certainly three inches—the fingers suffice to do this—a ligature is then applied and the vessel divided distal to the string. Should a large branch, *i. e.*, subscapular, appear, it requires a separate ligature. Lest the suppuration following the severe injuries under consideration should involve the large trunks of the brachial plexus and give rise to neuralgia on cicatrization, it is my habit to draw strongly upon the nerves and cut them with scissors quite a distance from the face of the flaps, so far with a happy result.

The following cases illustrate the method suggested :—

CASE II.—W. B., *æt.* 22 years, had his right arm caught in machinery belting and dragged between cogwheels. I saw the patient four hours after the accident. The humerus was crushed into many fragments, the comminution extending to the head of the bone; the soft parts were pulped, especially along the inner aspect of the arm. Amputation at the shoulder was effected by raising a deltoid flap of bruised tissue from without inwards, exarticulating and cutting a short inner flap from within outwards. The artery was secured provisionally, and then a ligature by means of an aneurism needle passed around the vessel above the bruised tissues. The nerves were drawn down and divided as high as possible. Much sloughing and suppuration ensued, followed by recovery. The stump was not painful when seen four years later, nor had it been.

CASE III.—W. E., aged 25, while intoxicated, was run over by laden railway cars. Left arm crushed to the shoulder. Amputation at shoulder-joint decided upon. In order to gain sufficient flap, skin was taken from in front of, and over, the acromion, cut with a scalpel from without in-

wards; a second flap below containing vessels and nerves was cut, after disarticulating, from within outwards. The artery was tied in the manner already indicated. The nerves were drawn upon and then cut as deeply in the wound as possible. Recovery ensued without notable circumstance. A painless scar marks the site of operation nine years after loss of arm.

CASE IV.—H. B., aged 25 years, was run over by railway cars. He evidently fell with the right arm resting on, not across, the rail, for the hand, forearm, and arm, as high as the surgical neck of the humerus were torn and crushed to a pulp. The deltoid was bruised and discoloured when seen one hour after injury. A deltoid flap was raised by transfixion, and after exarticulating a short lower flap cut from within outwards; both flaps were of bruised tissue. The axillary artery was strongly drawn down and cleared of tissue well beyond the surface of the flap, tied, and allowed to retract. The nerves were dissected out and divided. The wound was left almost entirely open; suppuration of bruised tissue and abscess in pectoral muscle took place, but the wound healed by granulation, and a painless stump resulted.

ARTICLE XVI.

THE COMPARATIVE ACTION OF HYDROBROMATE OF HOMATROPINE AND OF SULPHATE OF ATROPIA UPON THE IRIS AND CILIARY MUSCLE. By CHAS. A. OLIVER, M.D., of Philadelphia.

THESE series of experiments¹ were conducted on ten young emmetropic² eyes, care being taken to obtain persons of intelligence, and place them under the same conditions in reference to light and time of day.

The accompanying tables, based upon those of Donders, with the exception that here the actual loss of accommodation is expressed, instead of the remaining power, show the action of a single instillation of the one-fortieth and the one-twentieth of a grain each of hydrobromate of homatropine and of sulphate of atropia into an emmetropic eye, after intervals of one month.

¹ The author is engaged in a series of similar experiments with *Datura stramonium*, *Hyoscyamus niger*, *Duboisia myoporoides*, etc., which he intends combining with this paper, for future publication. It was his intention to make use of all the drugs upon the same eye, at the proposed intervals of one month, but through unavoidable circumstances he has been obliged to find a second emmetropic eye, thus making a slight break in the paper.

² Several previously corrected for H+Ah, in all of which the correcting glass and its distance from the eye were calculated for.

In every case, as soon as accommodation for Sn. 1½ became impossible, a convex glass was placed one-half inch before the eye—this in all instances being taken into account.